

## CLAIMS

What is claimed is:

1        1. A fiber optic module for coupling photons between  
2        optoelectronic devices and optical fibers, the fiber optic  
3        module comprising:  
4        a base;  
5        a first printed circuit board (PCB) arranged at a first  
6        angle with the base and parallel to a first optical axis of a  
7        first optoelectronic device, the first optoelectronic device  
8        having terminals coupled to the first printed circuit board; and  
9        a second printed circuit board (PCB) arranged at a second  
10       angle with the base and parallel to a second optical axis of a  
11       second optoelectronic device, the second optoelectronic device  
12       having terminals coupled to the second printed circuit board.

1       2. The fiber optic module of claim 1 further comprising:  
2       a housing coupled to the base.

1       3. The fiber optic module of claim 2 wherein,  
2       the housing is a shielded housing to encase the first and  
3       second printed circuit boards to reduce electromagnetic  
4       interference (EMI).

1       4. The fiber optic module of claim 3 wherein,  
2       the housing has an inner septum to separate the fiber optic  
3       module into a first side and a second side and the inner septum  
4       is a conductive shield to reduce crosstalk electromagnetic  
5       radiation.

1 5. The fiber optic module of claim 1 wherein,  
2 the base has a first and second opening;  
3 the first printed circuit board has a plurality of pins  
4 extending through the first opening in the base to couple to the  
5 system; and  
6 the second printed circuit board has a plurality of pins  
7 extending through the second opening in the base to couple to  
8 the system.

1 6. The fiber optic module of claim 5 wherein,  
2 the first and second opening in the base are a plurality of  
3 pin holes in the base.

1 7. The fiber optic module of claim 5 wherein,  
2 the first and second opening in the base are a first and  
3 second cutout in the base.

1 8. The fiber optic module of claim 1 wherein, the first  
2 and second printed circuit boards further comprises:  
3 electrical components coupled between the first and second  
4 optoelectronic device and the plurality of pins of the first  
5 printed circuit board and between the and second optoelectronic  
6 device and the plurality of pins of the second printed circuit  
7 board, the electrical components for controlling the first and  
8 second optoelectronic devices.

1 9. The fiber optic module of claim 1 wherein, the first  
2 printed circuit board further comprises:  
3 a ground plane to reduce electro-magnetic fields generated

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4 by the electrical components.

1 10. The fiber optic module of claim 1 wherein, the second  
2 printed circuit board further comprises:

3 a ground plane to reduce electro-magnetic fields generated  
4 by the electrical components.

1 11. The fiber optic module of claim 1 further comprising:

2 a first optical block coupled to the first optoelectronic  
3 device, the first optical block having a first opening to  
4 receive the first optoelectronic device, and

5 a first lens to couple photons between the first  
6 optoelectronic device and an optical fiber.

1 12. The fiber optic module of claim 11 further comprising:

2 a nose coupled to the base, the nose to receive an optical  
3 fiber connector and to hold an optical fiber substantially fixed  
4 and aligned with an optical opening of the optical block.

1 13. The fiber optic module of claim 12 further comprising:

2 a nose shield surrounding the nose to reduce  
3 electromagnetic interference.

1 14. The fiber optic module of claim 1 further comprising:

2 a second optical block coupled to the second optoelectronic  
3 device, the second optical block having

4 a second opening to receive the second optoelectronic  
5 device, and

6 a second lens to couple photons between the second  
7 optoelectronic device and an optical fiber.

"Reference" to "Fig. 1"

1        15. The fiber optic module of claim 11 further comprising:  
2        a second optical block coupled to the second optoelectronic  
3 device, the second optical block having  
4        a second opening to receive the second optoelectronic  
5 device, and  
6        a second lens to couple photons between the second  
7 optoelectronic device and an optical fiber.

1        16. The fiber optic module of claim 1 further comprising:  
2        an optical block coupled to the first and second  
3 optoelectronic devices, the optical block having  
4        first and second openings to receive the first and second  
5 optoelectronic devices,  
6        a first lens to couple photons between the first  
7 optoelectronic device and a first optical fiber, and  
8        a second lens to couple photons between the second  
9 optoelectronic device and a second optical fiber.

1        17. The fiber optic module of claim 16, wherein,  
2        the first lens of the optical block to launch photons into  
3 the first optical fiber from the first optoelectronic device.

1        18. The fiber optic module of claim 16, wherein,  
2        the second lens of the optical block is a focusing lens to  
3 receive photons from the second optical fiber and to couple them  
4 to the second optoelectronic device.

1        19. The fiber optic module of claim 16 further comprising:  
2        a nose coupled to the base, the nose to receive an optical

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3 fiber connector and to hold an optical fiber substantially fixed  
4 and aligned with an optical opening of the optical block.

1 20. The fiber optic module of claim 19 further comprising:  
2 a nose shield surrounding the nose to reduce  
3 electromagnetic interference.

1 21. The fiber optic module of claim 13, wherein,  
2 the first optoelectronic device is a photodetector.

1 22. The fiber optic module of claim 13, wherein,  
2 the second optoelectronic device is an emitter.

1 23. The fiber optic module of claim 22, wherein,  
2 the emitter is a vertical cavity surface emitting laser  
3 (VCSEL) .

1 24. A fiber optic transceiver for coupling photons between  
2 optoelectronic devices and optical fibers, the fiber optic  
3 transceiver comprising:

4 a base;

5 a first internal printed circuit board (PCB) arranged at a  
6 first angle with the base and parallel to a first optical axis  
7 of a first optoelectronic device, the first internal printed  
8 circuit board having a first connecting means to couple to an  
9 external printed circuit board, the first optoelectronic device  
10 having terminals coupled to the first internal printed circuit  
11 board;

12 a second internal printed circuit board (PCB) arranged at a  
13 second angle with the base and parallel to a second optical axis

14 of a second optoelectronic device, the second internal printed  
15 circuit board having a second connecting means to couple to an  
16 external printed circuit board, the second optoelectronic device  
17 having terminals coupled to the second printed circuit board;  
18 a housing coupled to the base, the housing to cover the  
19 first internal printed circuit board and the second internal  
20 printed circuit board.

1 25. The fiber optic transceiver of claim 24 wherein,  
2 the first internal printed circuit board further comprises:

3 first electrical components coupled between the first  
4 optoelectronic device and the first connecting means on a  
5 first side of the first internal printed circuit board, the  
6 first electrical components for controlling the first  
7 optoelectronic device, and

8 a first ground plane coupled to a second side of the  
9 first internal printed circuit board to reduce electro-  
10 magnetic fields;

11 and,

12 the second internal printed circuit board further  
13 comprises:

14 second electrical components coupled between the second  
15 optoelectronic device and the second connecting means on a first  
16 side of the second internal printed circuit board, the second  
17 electrical components for controlling the second optoelectronic  
18 device.

1 26. The fiber optic transceiver of claim 25 wherein,  
2 the second internal printed circuit board further  
3 comprises:

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4           a second ground plane coupled to a second side of the  
5           second internal printed circuit board to reduce electro-  
6           magnetic fields.

1           27. The fiber optic transceiver of claim 24, wherein,  
2           the first connecting means and the second connecting means  
3           are pins to couple to pin receptacles of the external printed  
4           circuit board.

1           28. The fiber optic transceiver of claim 24, wherein,  
2           the first connecting means and the second connecting means  
3           are connectors to couple into connectors of the external printed  
4           circuit board.

1           29. The fiber optic transceiver of claim 24 further  
2           comprising:

3           an optical block coupled to the first optoelectronic device  
4           and the second optoelectronic device, the optical block having a  
5           first lens to couple photons between the first optoelectronic  
6           device and a first optical fiber and a second lens to couple  
7           photons between the second optoelectronic device and a second  
8           optical fiber.

1           30. The fiber optic transceiver of claim 24 further  
2           comprising:

3           a first optical block coupled to the first optoelectronic  
4           device, the first optical block having a first lens to couple  
5           photons between the first optoelectronic device and a first  
6           optical fiber, and

7           a second optical block coupled to the second optoelectronic

8 device, the second optical block having a second lens to couple  
9 photons between the second optoelectronic device and a second  
10 optical fiber.

1 31. The fiber optic transceiver of claim 24 further  
2 comprising:

3 a nose coupled to the base, the nose for receiving an  
4 optical fiber connector and holding a pair of optical fibers  
5 substantially fixed and aligned with the first optoelectronic  
6 device and the second optoelectronic device.

1 32. The fiber optic transceiver of claim 31 further  
2 comprising:

3 a nose shield surrounding the nose to reduce  
4 electromagnetic interference.

1 33. The fiber optic transceiver of claim 24 further  
2 comprising:

3 an internal shield inserted between the first internal  
4 printed circuit board and the second internal printed circuit  
5 board, the internal shield to reduce electrical crosstalk.

1 34. A method of assembling a fiber optic transceiver, the  
2 method comprising:

- 3 a) providing an optical block having a lens to focus  
4 photons and an opening,  
5 b) coupling an optoelectronic device into the opening of  
6 the optical block,  
7 c) coupling a printed circuit board on an angle to  
8 terminals of the optoelectronic device, the printed circuit



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9 board having at least one electronics component between one  
10 terminal of the optoelectronic device and one signal trace on  
11 the printed circuit board; and

12 d) assembling a housing and a base together around the  
13 optical block, the optoelectronic device and the printed circuit  
14 board and wherein the printed circuit board is angled with  
15 respect to a plane of the base.

1 35. The method of claim 34 of assembling a fiber optic  
2 transceiver, the method further comprising:

3 e) prior to assembling the housing and the base,  
4 installing a nose having a fiber optic receptacle to receive a  
5 fiber optic cable.

1 36. The method of claim 35 of assembling a fiber optic  
2 transceiver, the method further comprising:

3 f) installing a nose shield over the nose.

1 37. The method of claim 36 of assembling a fiber optic  
2 transceiver, wherein,

3 the nose is non-conductive and the nose shield is  
4 conductive.

1 38. The method of claim 36 of assembling a fiber optic  
2 transceiver, wherein,

3 the housing is conductive.

1 39. A fiber optic module comprising:

2 a first optical block having a first opening to receive a  
3 first optoelectronic device;

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4 the first optoelectronic device coupled into the first  
5 opening;  
6 a second optical block having a second opening to receive a  
7 second optoelectronic device;  
8 the second optoelectronic device coupled into the second  
9 opening;  
10 a first printed circuit board coupled to terminals of the  
11 first optoelectronic device on an angle with a plane of the  
12 first optical block, the first printed circuit board parallel to  
13 a first optical axis of the first optoelectronic device; and  
14 a second printed circuit board coupled to terminals of the  
15 second optoelectronic device on an angle with a plane of the  
16 second optical block, the second printed circuit board parallel  
17 to a second optical axis of the second optoelectronic device.

1 40. The fiber optic module of claim 39, wherein the fiber  
2 optic module is a fiber optic transceiver and  
3 the first optoelectronic device is a transmitter to couple  
4 photons into a first optical fiber, and  
5 the second optoelectronic device is a receiver to receive  
6 photons from a second optical fiber.

1 41. A fiber optic module comprising:  
2 an optical block having a first opening to receive a first  
3 optoelectronic device and a second opening to receive a second  
4 optoelectronic device;  
5 the first optoelectronic device coupled into the first  
6 opening;  
7 the second optoelectronic device coupled into the second  
8 opening;

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9           a base having a first guide rail and a second guide rail;  
10          a first printed circuit board coupled to terminals of the  
11 first optoelectronic device in parallel to a first optical axis  
12 of the first optoelectronic device, the first printed circuit  
13 board coupled to the first guide rail of the base; and  
14          a second printed circuit board coupled to terminals of the  
15 second optoelectronic device in parallel to a second optical  
16 axis of the second optoelectronic device, the second printed  
17 circuit board coupled to the second guide rail of the base.

1           42. The fiber optic module of claim 41 further comprising:  
2           a housing coupled to the base.

1           43. The fiber optic module of claim 42 wherein,  
2           the housing is a shielded housing to encase the first and  
3 second printed circuit board to reduce electromagnetic  
4 interference (EMI).

1           44. The fiber optic module of claim 41 wherein,  
2           the base has a pair of cutouts to allow pins of the first  
3 printed circuit board and pins of the second printed circuit  
4 board to extend through.

1           45. The fiber optic module of claim 41 wherein,  
2           the base has a pair of openings to allow pins of the first  
3 printed circuit board and pins of the second printed circuit  
4 board to extend through.

1           46. The fiber optic module of claim 41, wherein the fiber  
2 optic module is a fiber optic transceiver and

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3        the first optoelectronic device is a transmitter to couple  
4 photons into a first optical fiber, and  
5        the second optoelectronic device is a receiver to receive  
6 photons from a second optical fiber.

1        47. A fiber optic module comprising:  
2        an optical block having a first opening to receive a first  
3 optoelectronic device and a second opening to receive a second  
4 optoelectronic device;  
5        the first optoelectronic device coupled into the first  
6 opening;  
7        the second optoelectronic device coupled into the second  
8 opening;  
9        a base having a first pair of brackets on one side and a  
10 second pair of brackets on an opposite side;  
11        a first printed circuit board coupled to terminals of the  
12 first optoelectronic device in parallel to a first optical axis  
13 of the first optoelectronic device, the first printed circuit  
14 board coupled to the first pair of brackets of the base; and  
15        a second printed circuit board coupled to terminals of the  
16 second optoelectronic device in parallel to a second optical  
17 axis of the second optoelectronic device, the second printed  
18 circuit board coupled to the second pair of brackets of the  
19 base.

1        48. The fiber optic module of claim 47 further comprising:  
2        a housing coupled to the base.

1        49. The fiber optic module of claim 48 wherein,  
2        the housing is a shielded housing to encase the first and

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3 second printed circuit board to reduce electromagnetic  
4 interference (EMI).

1 50. The fiber optic module of claim 47 wherein,  
2 the base has a pair of cutouts to allow pins of the first  
3 printed circuit board and pins of the second printed circuit  
4 board to extend through.

1 51. The fiber optic module of claim 47 wherein,  
2 the base has a pair of openings to allow pins of the first  
3 printed circuit board and pins of the second printed circuit  
4 board to extend through.

1 52. The fiber optic module of claim 47, wherein the fiber  
2 optic module is a fiber optic transceiver and  
3 the first optoelectronic device is a transmitter to couple  
4 photons into a first optical fiber, and  
5 the second optoelectronic device is a receiver to receive  
6 photons from a second optical fiber.

1 53. A fiber optic module comprising:  
2 an optical block having a first opening to receive a first  
3 optoelectronic device and a second opening to receive a second  
4 optoelectronic device, the optical block further having a first  
5 slot to receive an end of a first printed circuit board and a  
6 second slot to receive an end of a second printed circuit board;  
7 the first optoelectronic device coupled into the first  
8 opening;  
9 the second optoelectronic device coupled into the second  
10 opening;

11 a base;  
12 a first printed circuit board coupled to terminals of the  
13 first optoelectronic device in parallel to a first optical axis  
14 of the first optoelectronic device, the first printed circuit  
15 board coupled to the first slot of the optical block; and  
16 a second printed circuit board coupled to terminals of the  
17 second optoelectronic device in parallel to a second optical  
18 axis of the second optoelectronic device, the second printed  
19 circuit board coupled to the second slot of the optical block.

1 54. The fiber optic module of claim 53 further comprising:  
2 a housing coupled to the base.

1 55. The fiber optic module of claim 55 wherein,  
2 the housing is a shielded housing to encase the first and  
3 second printed circuit board to reduce electromagnetic  
4 interference (EMI).

1 56. The fiber optic module of claim 53 wherein,  
2 the base has a pair of cutouts to allow pins of the first  
3 printed circuit board and pins of the second printed circuit  
4 board to extend through.

1 57. The fiber optic module of claim 53 wherein,  
2 the base has a pair of openings to allow pins of the first  
3 printed circuit board and pins of the second printed circuit  
4 board to extend through.

1 58. The fiber optic module of claim 53, wherein the fiber  
2 optic module is a fiber optic transceiver and

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3 the first optoelectronic device is a transmitter to couple  
4 photons into a first optical fiber, and  
5 the second optoelectronic device is a receiver to receive  
6 photons from a second optical fiber.

1 59. A fiber optic module comprising:  
2 an optical block having a first opening to receive a first  
3 optoelectronic device and a second opening to receive a second  
4 optoelectronic device;  
5 the first optoelectronic device coupled into the first  
6 opening;  
7 the second optoelectronic device coupled into the second  
8 opening;  
9 a base;  
10 a first printed circuit board on a first side of the fiber  
11 optical module coupled to terminals of the first optoelectronic  
12 device in parallel to a first optical axis of the first  
13 optoelectronic device;  
14 a second printed circuit board on the first side of the  
15 fiber optic module coupled to the first printed circuit board  
16 and having a first connecting means to couple to an external  
17 printed circuit board;  
18 a third printed circuit board on a second side of the fiber  
19 optic module coupled to terminals of the second optoelectronic  
20 device in parallel to a second optical axis of the second  
21 optoelectronic device; and  
22 a fourth printed circuit board on the second side of the  
23 fiber optic module coupled to the third printed circuit board  
24 and having a second connecting means to couple to the external  
25 printed circuit board.

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1        60. The fiber optic module of claim 59 further comprising:  
2        a housing coupled to the base.

1        61. The fiber optic module of claim 60 wherein,  
2        the housing is a shielded housing to encase the first and  
3        second, third and fourth printed circuit boards to reduce  
4        electromagnetic interference (EMI).

1        62. The fiber optic module of claim 59 wherein,  
2        the base has a pair of cutouts to allow pins of the first  
3        printed circuit board and pins of the second printed circuit  
4        board to extend through.

1        63. The fiber optic module of claim 59 wherein,  
2        the base has a pair of openings to allow pins of the first  
3        printed circuit board and pins of the second printed circuit  
4        board to extend through.

1        64. The fiber optic module of claim 59, wherein the fiber  
2        optic module is a fiber optic transceiver and  
3        the first optoelectronic device is a transmitter to couple  
4        photons into a first optical fiber, and  
5        the second optoelectronic device is a receiver to receive  
6        photons from a second optical fiber.

1        65. The fiber optic module of claim 59, wherein,  
2        the first connecting means and the second connecting means  
3        are pins to couple to pin receptacles of the external printed  
4        circuit board.





4 optoelectronic device;  
5 the first optoelectronic device coupled into the first  
6 opening;  
7 the second optoelectronic device coupled into the second  
8 opening;  
9 a base;  
10 a first angled printed circuit board (PCB) coupled to  
11 terminals of the first optoelectronic device in parallel to a  
12 first optical axis of the first optoelectronic device, the first  
13 angled printed circuit board arranged at a first angle to slant  
14 inward from the base; and  
15 a second angled printed circuit board (PCB) coupled to  
16 terminals of the second optoelectronic device in parallel to a  
17 second optical axis of the second optoelectronic device, the  
18 second angled printed circuit board arranged at a second angle  
19 to slant inward from the base.

1 73. The fiber optic module of claim 72 further comprising:  
2 a housing coupled to the base.

1 74. The fiber optic module of claim 73 wherein,  
2 the housing is a shielded housing to encase the first and  
3 second angled printed circuit boards to reduce electromagnetic  
4 interference (EMI).

1 75. The fiber optic module of claim 73 wherein,  
2 the first angled printed circuit board and the second  
3 angled printed circuit board each have a plurality of pins to  
4 couple to a host system printed circuit board.

1        76. The fiber optic module of claim 75 wherein,  
2        the base has a pair of cutouts to allow the pins of the  
3 first angled printed circuit board and the pins of the second  
4 angled printed circuit board to extend through.

1        77. The fiber optic module of claim 75 wherein,  
2        the base has a pair of openings to allow the pins of the  
3 first angled printed circuit board and the pins of the second  
4 angled printed circuit board to extend through.

1        78. The fiber optic module of claim 72, wherein the fiber  
2 optic module is a fiber optic transceiver and  
3        the first optoelectronic device is a transmitter to couple  
4 photons into a first optical fiber, and  
5        the second optoelectronic device is a receiver to receive  
6 photons from a second optical fiber.

1        79. The fiber optic module of claim 72 wherein,  
2        the first angled printed circuit board and the second  
3 angled printed circuit board each have a connector to couple to  
4 a connector of a host system printed circuit board.

1        80. The fiber optic module of claim 72 further comprising:  
2        a housing having an opening at an end coupled to the base.

1        81. The fiber optic module of claim 80, wherein,  
2        the first angled printed circuit board and the second  
3 angled printed circuit board each have a connector to couple to  
4 a connector of a host system printed circuit board through the

5 opening at the end of the housing.

1 82. The fiber optic module of claim 72 wherein,  
2 the base includes an inner septum to separate the fiber  
3 optic module into a first side and a second side.

1 83. The fiber optic module of claim 72 wherein,  
2 the first and second angled printed circuit boards are in  
3 an angled configuration.

1 84. A fiber optic module comprising:  
2 an optical block having a first opening to receive a first  
3 optoelectronic device;  
4 the first optoelectronic device coupled into the first  
5 opening;  
6 a motherboard printed circuit board;  
7 a first daughterboard printed circuit board (PCB) coupled  
8 to terminals of the first optoelectronic device in parallel to a  
9 first optical axis of the first optoelectronic device, the first  
10 daughterboard printed circuit board coupled at a first angle to  
11 the motherboard printed circuit board.

1 85. The fiber optic module of claim 84 further comprising:  
2 a housing coupled to the base.

1 86. The fiber optic module of claim 85 wherein,  
2 the housing is a shielded housing to encase the first  
3 daughterboard printed circuit board to reduce electromagnetic  
4 interference (EMI).

87. The fiber optic module of claim 84 wherein,  
the first angle is substantially ninety degrees so that the  
first daughterboard printed circuit board is coupled  
perpendicular to the motherboard printed circuit board.

88. The fiber optic module of claim 84 wherein,  
the motherboard printed circuit board has a plurality of  
pins to couple to an external printed circuit board.

89. The fiber optic module of claim 84 wherein,  
the motherboard printed circuit board has a connector to  
couple to a connector of an external printed circuit board.

90. The fiber optic module of claim 84 wherein,  
the first daughterboard printed circuit board has traces  
coupled to traces of the motherboard printed circuit board.

91. The fiber optic module of claim 90 wherein,  
the traces of first daughterboard printed circuit board are  
coupled traces of the motherboard printed circuit board by  
solder joints.

92. The fiber optic module of claim 84 wherein,  
the optical block further having a second opening to  
receive a second optoelectronic device, and  
the fiber optic module further comprises,  
a second optoelectronic device coupled into the second  
opening, and  
a second daughterboard printed circuit board (PCB)



1        98. The fiber optic module of claim 92 wherein,  
2        the motherboard printed circuit board has a plurality of  
3 pins to couple to an external printed circuit board.

1        99. The fiber optic module of claim 92 wherein,  
2        the motherboard printed circuit board has a connector to  
3 couple to a connector of an external printed circuit board.

1        100. The fiber optic module of claim 84 wherein,  
2        the first daughterboard printed circuit board has traces  
3 coupled to traces of the motherboard printed circuit board, and  
4        the second daughterboard printed circuit board has traces  
5 coupled to traces of the motherboard printed circuit board..

1        101. The fiber optic module of claim 90 wherein,  
2        the traces of first daughterboard printed circuit board are  
3 coupled traces of the motherboard printed circuit board by  
4 solder joints, and  
5        the traces of second daughterboard printed circuit board  
6 are coupled traces of the motherboard printed circuit board by  
7 solder joints.

1        102. The fiber optic module of claim 92 further comprising:  
2        a housing having an opening at an end coupled to the base.

1        103. The fiber optic module of claim 102, wherein,  
2        the first daughterboard printed circuit board and the  
3 second daughterboard printed circuit board each have a connector  
4 to couple to a connector of a host system printed circuit board

5 through the opening at the end of the housing.

1 104.The fiber optic module of claim 92 wherein,  
2 the motherboard printed circuit board includes an inner  
3 septum to separate the fiber optic module into a first side and  
4 a second side.

1 105.The fiber optic module of claim 104 wherein,  
2 the inner septum is a conductive shield to reduce crosstalk  
3 electromagnetic radiation.

1 106.The fiber optic module of claim 92 further comprising:  
2 a housing having an inner septum to separate the fiber  
3 optic module into a first side and a second side, the housing  
4 coupled to the base.

1 107.The fiber optic module of claim 106 wherein,  
2 the housing is a conductive shielded housing to encase the  
3 first daughterboard printed circuit board to reduce  
4 electromagnetic interference (EMI) and the septum is a  
5 conductive shield to reduce crosstalk electromagnetic radiation.

1 108.The fiber optic module of claim 92 wherein,  
2 the first and second daughterboard printed circuit boards  
3 are vertical printed circuit boards and the motherboard printed  
4 circuit board is a horizontal motherboard printed circuit board.

1 109.A fiber optic module comprising:  
2 an optical block having a first opening to receive a first  
3 optoelectronic device and a second opening to receive a second



4 optoelectronic device;  
5 the first optoelectronic device coupled into the first  
6 opening;  
7 the second optoelectronic device coupled into the second  
8 opening;  
9 a base;  
10 a first angled printed circuit board (PCB) coupled to  
11 terminals of the first optoelectronic device in parallel to a  
12 first optical axis of the first optoelectronic device, the first  
13 angled printed circuit board arranged at a first angle with the  
14 base;  
15 a second angled printed circuit board (PCB) coupled to  
16 terminals of the second optoelectronic device in parallel to a  
17 second optical axis of the second optoelectronic device, the  
18 second angled printed circuit board arranged at a second angle  
19 with the base; and  
20 wherein the first angled printed circuit board and the  
21 second angled printed circuit board are substantially parallel  
22 to each other.

1 110. The fiber optic module of claim 109 further comprising:  
2 a housing coupled to the base.

1 111. The fiber optic module of claim 110 wherein,  
2 the housing is a shielded housing to encase the first and  
3 second angled printed circuit boards to reduce electromagnetic  
4 interference (EMI).

1 112. The fiber optic module of claim 109 wherein,  
2 the first angled printed circuit board and the second

3 angled printed circuit board each have a plurality of pins to  
4 couple to a host system printed circuit board.

1 113.The fiber optic module of claim 112 wherein,  
2 the base has a pair of cutouts to allow the pins of the  
3 first angled printed circuit board and the pins of the second  
4 angled printed circuit board to extend through.

1 114.The fiber optic module of claim 112 wherein,  
2 the base has a pair of openings to allow the pins of the  
3 first angled printed circuit board and the pins of the second  
4 angled printed circuit board to extend through.

1 115.The fiber optic module of claim 109, wherein the fiber  
2 optic module is a fiber optic transceiver and  
3 the first optoelectronic device is a transmitter to couple  
4 photons into a first optical fiber, and  
5 the second optoelectronic device is a receiver to receive  
6 photons from a second optical fiber.

1 116.The fiber optic module of claim 109 wherein,  
2 the first angled printed circuit board and the second  
3 angled printed circuit board each have a connector to couple to  
4 a connector of a host system printed circuit board.

1 117.The fiber optic module of claim 109 further comprising:  
2 a housing having an opening at an end coupled to the base.

1 118.The fiber optic module of claim 117, wherein,  
2 the first angled printed circuit board and the second

3 angled printed circuit board each have a connector to couple to  
4 a connector of a host system printed circuit board through the  
5 opening at the end of the housing.

1 119.The fiber optic module of claim 109 wherein,  
2 the base includes an inner septum to separate the fiber  
3 optic module into a first side and a second side.

1 120.The fiber optic module of claim 109 further comprising:  
2 a housing having an inner septum to separate the fiber  
3 optic module into a first side and a second side, the housing  
4 coupled to the base.

1 121.The fiber optic module of claim 120 wherein,  
2 the housing is a conductive shielded housing to encase the  
3 first daughterboard printed circuit board to reduce  
4 electromagnetic interference (EMI) and the septum is a  
5 conductive shield to reduce crosstalk electromagnetic radiation.

1 122.The fiber optic module of claim 109 wherein,  
2 the first and second angled printed circuit boards are in a  
3 parallel angled configuration.

1 123.A fiber optic module comprising:  
2 an optical block having a first opening to receive a first  
3 optoelectronic device and a second opening to receive a second  
4 optoelectronic device;  
5 the first optoelectronic device coupled into the first  
6 opening;  
7 the second optoelectronic device coupled into the second

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8 opening;  
9 a base;  
10 a first angled printed circuit board (PCB) coupled to  
11 terminals of the first optoelectronic device in parallel to a  
12 first optical axis of the first optoelectronic device, the first  
13 angled printed circuit board arranged at a first angle to slant  
14 outward from the base; and  
15 a second angled printed circuit board (PCB) coupled to  
16 terminals of the second optoelectronic device in parallel to a  
17 second optical axis of the second optoelectronic device, the  
18 second angled printed circuit board arranged at a second angle  
19 to slant outward from the base.

1 124.The fiber optic module of claim 123 further comprising:  
2 a housing coupled to the base.

1 125.The fiber optic module of claim 124 wherein,  
2 the housing is a shielded housing to encase the first and  
3 second angled printed circuit boards to reduce electromagnetic  
4 interference (EMI).

1 126.The fiber optic module of claim 123 wherein,  
2 the first angled printed circuit board and the second  
3 angled printed circuit board each have a pin header with a  
4 plurality of pins to couple to a host system printed circuit  
5 board.

1 127.The fiber optic module of claim 123 wherein,  
2 the first angled printed circuit board and the second  
3 angled printed circuit board each have a plurality of pins to

4 couple to a host system printed circuit board.

1 128.The fiber optic module of claim 127 wherein,  
2 the base has a pair of cutouts to allow the pins of the  
3 first angled printed circuit board and the pins of the second  
4 angled printed circuit board to extend through.

1 129.The fiber optic module of claim 127 wherein,  
2 the base has a pair of openings to allow the pins of the  
3 first angled printed circuit board and the pins of the second  
4 angled printed circuit board to extend through.

1 130.The fiber optic module of claim 123, wherein the fiber  
2 optic module is a fiber optic transceiver and  
3 the first optoelectronic device is a transmitter to couple  
4 photons into a first optical fiber, and  
5 the second optoelectronic device is a receiver to receive  
6 photons from a second optical fiber.

1 131.The fiber optic module of claim 123 wherein,  
2 the first angled printed circuit board and the second  
3 angled printed circuit board each have a connector to couple to  
4 a connector of a host system printed circuit board.

1 132.The fiber optic module of claim 123 further comprising:  
2 a housing having an opening at an end coupled to the base.

1 133.The fiber optic module of claim 132, wherein,  
2 the first angled printed circuit board and the second  
3 angled printed circuit board each have a connector to couple to

4 a connector of a host system printed circuit board through the  
5 opening at the end of the housing.

1 134.The fiber optic module of claim 123 wherein,  
2 the base includes an inner septum to separate the fiber  
3 optic module into a first side and a second side.

1 135.The fiber optic module of claim 123 further comprising:  
2 a housing having an inner septum to separate the fiber  
3 optic module into a first side and a second side, the housing  
4 coupled to the base.

1 136.The fiber optic module of claim 135 wherein,  
2 the housing is a conductive shielded housing to encase the  
3 first daughterboard printed circuit board to reduce  
4 electromagnetic interference (EMI) and the septum is a  
5 conductive shield to reduce crosstalk electromagnetic radiation.

1 137.The fiber optic module of claim 123 wherein,  
2 the first and second angled printed circuit boards are in  
3 an angled configuration.

1 138.The fiber optic module of claim 123 wherein,  
2 the first and second angled printed circuit boards are in  
3 an V configuration.